

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in the Treatment of Milk and Cream

We, ECREMEUSES MELOTTE, SOCIETE ANONYME, a Belgian Company of Remicourt, Belgium, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the thermal treatment on farms of milk and cream in the churns which serve for their transportation, the said churns being covered with a thin layer or film of a heat exchanging liquid which is caught in a vat.

It is already known to pasteurise milk on farms in the churns which serve for its transportation. For this purpose the churns are placed in vertical position on wheels which are rotated, the churns being immersed more or less completely in a tank of water brought to pasteurisation temperature. After this operation the hot water is replaced by cold water or by ice or the churns are cooled in a refrigerator separate from the pasteurising apparatus.

It is likewise known to cool churns of milk on farms, by immersing them partially in cold water and by causing water to trickle over that part of their necks which is not immersed. At the same time the water is agitated in order to increase its cooling effect.

On the other hand, it is known in the alimentary preserve industry to sterilise food and drink in sealed cylindrical tins by causing these tins to pass, incompletely filled, through a heat exchanging apparatus. These tins are arranged with their axes horizontal and are set in rotation about said axes during their transportation, by reason of their being placed on rollers which are subjected simultaneously to a movement of translation and a rotary movement about their respective axes. Above the path followed by the tins through the apparatus are

arranged means for sprinkling the tins with water at varying temperatures according to the thermal treatment desired.

The present invention has for its object to provide a simple apparatus which can advantageously be used on farms for the cooling of milk and cream or for the pasteurisation of these products and also for the sterilisation of the churns and other utensils with which these products are generally in contact while they are on the farm.

The apparatus according to the present invention comprises means which permit of a churn closed by an airtight cover being rotated about its longitudinal axis while the latter is disposed horizontally or nearly horizontally at a level such that the churn is partially immersed in the heat exchanging liquid caught in the body of the vat.

When a churn, partially filled with milk, is placed in this apparatus, its rotation causes a thin layer or film of milk to adhere to the upper part of the inner surface of the churn. Owing to the fact that almost the whole of the outer surface of the churn is covered with a thin layer or film of heat-exchanging liquid derived from the adhesion thereof to that part of the churn passing through the liquid, the exchange of heat through the metal walls of the churn is very rapid, so that during each revolution of the churn it can take place between and through the two thin layers of liquid, one on the inside and one on the outside of the churn.

Preferably a pipe for the supply of cold liquid opens into the bottom of the vat, which is also provided with an overflow pipe for the continuous discharge of liquid from the upper surface of the liquid in the vat while a continuous supply of cold liquid enters the bottom of the vat.

In order to keep the temperature of

the heat-exchanging liquid in contact with the churn as close as possible to that of the liquid supplied to the vat, the overflow pipe is arranged with respect to the bottom of the vat in such a way that only a shallow body of liquid is maintained therein.

In order to reduce heat losses in cases in which the churn has to be heated (heat being provided by a furnace situated beneath the vat or by electrical immersion devices) and to facilitate the work of the staff, the vat may advantageously be provided with a cover.

Preferably, the said cover is guided in such a way that it can only be raised, from its closed position, by a vertical movement of translation up to a level at which it can then be tilted upwards on a pivot located on the side remote from that on which stands the person who raises the cover.

In order that the invention may be better understood, an example of an apparatus in accordance therewith will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation taken on the line I—I in Figure 2,

Figure 2 is a cross-section taken on the line II—II in Figure 1,

Figures 3 and 4 are respectively front and side views of the upper part of the apparatus.

The apparatus comprises a vat divided up into two compartments 2 and 3 by a removable partition 4. Below the vat, there is a furnace 5 comprising a grate 6 and a flue 7. In each of the compartments 2 and 3 of the vat, there are rollers 8 having horizontal axes and provided with rubber tyre bands 9. Cylindrical churns 10 can be placed on these. One of the rollers 8 in each compartment is driven so that the churn which rests on the bands 9 is rotated about a horizontal axis.

Water can be introduced into the bottom of each compartment through the pipe 11 discharging into the bottom 12 of the vat. The speed of rotation of the churn is determined by the desired rate of transmission of heat between the water and milk or cream through the metal wall of the churn. An overflow pipe 13 is so arranged relatively to the bottom of the vat that the depth of water is small. The part of this tube which is above the bottom 12 is removable so that the pipe 13 can be transformed into a drain pipe. The rollers 8 and the bands 9 must, of course, be at such a level that the churn 10 which they support dips partially into the water when the removable part is in place on the pipe 13. The bottom 12 is

concave upwards so that it is approximately parallel to the churn carried by the rollers. This allows the volume of water in each compartment to be kept very small provided that the bottom 12 is positioned so as to be close to the peripheral wall of the horizontally disposed churn containing the milk or cream under treatment.

The outside walls 14 and 16 are provided with a layer of heat insulating material 15, 17. The walls 14 extend over the whole height of the hearth 5 and over the height of the lower part of the tank while the walls 16 constitute the part of this tank above the walls 14. Each of the compartments 2 and 3 is provided with a cover extending over approximately the whole height of the vat on the side 18 where the person who lifts the cover is placed. In other words, the cover extends substantially below the upper level of the vat. The same applies to the two side plates 19. Each of the covers can be lifted independently of the other by being swung about a pin 20. (Figure 2).

In practice, it is of advantage to mount each cover in the manner shown in Figures 3 and 4 so that the person who lifts the cover is not incommoded by the steam when the cover starts to be lifted.

The two lateral plates 19 of the cover each carry a roller 20 which, when the cover closes the vat, is engaged between two vertical walls 21 which serve as a guide for it. The cover has near each side plate 19, a fork 22 embracing a shaft 23 which rotates in two supports 24 fixed in a manner not shown to the lower fixed wall 14 of the apparatus at a point near the partition 4 i.e. on the edge of the cover remote from that where stands the person who lifts the cover.

At each end of this shaft, are keyed levers 25, 26, which make contact with the cover through a pin 27 fixed to the cover and sliding in slots 28 in the levers.

With this method of assembly, if, by manipulating a handle 29 on the lever 25, this lever is caused to pass from the position shown in full lines to that shown by the line 25', the cover can be displaced only vertically because the rollers 20 are guided vertically as far as 20' and the forks 22 slide vertically relatively to the shaft 23 while the pins 27 move in the slots 28 of the levers 25, 26. The cover then occupies a position such as that shown in dotted lines as 18' and the steam from the vat can escape above the upper edge of the wall 4.

When the lever 25 is moved from the position 25' to the position 25'', the cover passes from the position 18' to the posi-

tion 18", its forks 22 turning about the shaft 23. The roller 20 then takes up the position 20". The cover can be maintained in this last position by a hooking device 30 cooperating with the pin 27 occupying the position designated 27". Alternatively, a counter-weight can be used for the same purpose.

When the apparatus in accordance with the invention is available, milk products can easily be obtained having a quality and good keeping powers which can rival those of industrial dairies. Indeed, the same operations as are carried out in industrial dairies can be carried out without trouble and with a single apparatus namely:—sterilization of the churns and of the other utensils which are to come into contact with the milk or cream and pasteurization of the milk or cream.

The washing and the drying of the churns before sterilization are likewise made very easy by the use of the apparatus in accordance with the invention.

Indeed, after the usual washing and rinsing of the churns, they can, in order to be dried, be introduced into the apparatus with their covers removed or half open, so as to be brought to the boiling temperature of water, which takes place in a very short time. Each churn, as soon as it has reached, this temperature, is removed from the apparatus and the little water which still moistens the inside of the churn is instantaneously evaporated because of the quantity of heat stored by the mass of the churn. After evaporation of this water, the cover is replaced on the churn so as to close it hermetically.

To sterilize the dry closed churns, they are replaced in the apparatus and are caused to rotate for two or three minutes in boiling water and its steam. At the end of this time, the churns and the air which they contain reach the sterilizing temperature. Each churn, after this sterilizing treatment, is removed from the apparatus and can, at this stage, await the moment at which it will be used. The air inside them being sterile and the churns being hermetically closed by their air tight covers, microbic contamination from the external air is no longer possible.

Churns sterilized in this way are used for collecting either milk or cream. After being filled with milk or cream, the churn is closed by means of its airtight cover and it is placed in the apparatus to be rapidly cooled by a current of cold water, for example, water coming from a well. It is known that, to be effective, the cooling of milk or cream must be as

rapid as possible and must be effected out of contact with the air.

Rapid cooling is obtained as a result of the rotation of the churn, which is partly in the cold water, and of the rapid and continuous elimination of the heated water. Indeed, when the part of the churn which dips into the water comes out of the water, a thin layer of water adheres to it and turns with it. This layer of water heats up during the rotation of the churn until it comes into contact again with the cooling water. At this instant, the thin layer of water separates from the churn because of the difference between its density and that of the cold water in the vat.

The heated water which gathers on the surface of the water in the vat is drawn off through the overflow pipe 13 while the fresh cooling water is added at the bottom. As there is only a small quantity of water in the vat, the addition of the fresh water can maintain the water in the vat at a temperature very near that of the water in the feed pipe.

The liquid inside the churn also adheres to the inner surface thereof. Consequently, above the liquid levels, there is a thin layer of water on the outer side of the churn wall and a thin layer of the milk or cream to be cooled adhering to the inner side of the churn wall, through which these liquid layers rapidly effect an exchange of heat.

The speed of rotation of the churn is such that the liquid mass contained in it does not turn with it.

Thus the thin layer of milk or cream is permitted to adhere to the upper interior surface of the rotating churn where it can give up its heat without coming into contact with the outside atmosphere, and, therefore, without risk of airborne contamination.

In short, the rapid cooling of the milk or cream is largely due to the rotation of the churn, allowing a thin film of milk or cream to be maintained on the inside of the churn wall and a thin film of cool water, formed on the outside of said churn wall, to be continuously renewed, such renewal being greatly assisted by rapid evacuation of the heated water from the vat. This continuous evacuation of heated water allows a constant supply of new cooling water to be maintained, thereby ensuring the maximum difference of temperature relatively to the milk or cream to be cooled.

For pasteurizing the milk or cream, the water contained in the vat is heated to boiling point. The rotation of the churn filled with milk or cream has the effect of bringing the liquid to be pasteurized

rapidly to a temperature allowing of the destruction of ferments and micro-organisms, because the heat exchange from outside to inside is carried out
5 under conditions similar to those described for the cooling.

The most common method used for pasteurization consists in heating the milk or cream to a temperature of about
10 65° C. and in maintaining this temperature for 20 to 30 minutes.

In order to increase the output of the apparatus without in any way changing the length of the pasteurization period,
15 the churn can be removed from the apparatus as soon as the pasteurization temperature of the liquid inside it is reached and can be placed under a heat-insulated bell forming part of the access-
20 ories which are delivered with the apparatus. This churn is then allowed to remain in the bell for a length of time sufficient to enable perfect pasteuriza-
tion to be effected.

When the pasteurization is completed,
25 use can be made of the heat contained in the water in the vat to sterilize immediately the various utensils used in farms for the treatment of milk.

The parts of a cream separator such as the bowl, the reservoir and other access-
30 ories which come into contact with the milk, as well as the milking pails and the milking pots of the milking machines should be sterilized before use. Their
35 sterilization can follow that of the churns in order to make the work more easy and can thus be effected last of all.

With this object, these utensils are placed
40 in the apparatus in which the water is still boiling and are allowed to remain there in a steam bath or in direct contact with the boiling water in the vat. After a few minutes, the vat is emptied of its
45 water by removal of the upper removable part of the pipe 13 and the utensils are left in the apparatus which is maintained closed until they are about to be used.

The hot water which is drained off can
50 be used for any other purposes on the farm.

The sterilization of the churns and other utensils can be effected at the time
55 which is most convenient for the use of the apparatus as the airtight cover of the churns remain placed on the latter after their sterilization and the other utensils remain in the closed apparatus which is
60 itself, of necessity, also sterilized.

The furnace can be fired with wood, coal, gas or liquid fuel as desired. Elec-
tric heating can also be used. In the
65 latter case, the heating resistances can

ferably immersed in the liquid at the bottom of the vat.

Having now particularly described and ascertained the nature of our said inven-
70 tion and in what manner the same is to be performed, we declare that what we claim is:—

1. Apparatus for the thermal treat-
ment on farms of milk and cream in the
75 churns which serve for their transporta-
tion said churns being covered with a thin layer or film of a heat exchanging liquid which is caught in a vat, said apparatus comprising means which per-
mit a churn closed by an airtight cover
80 to be rotated about its longitudinal axis while the latter is disposed horizontally or nearly horizontally at a level such that the churn is partially immersed in the heat exchanging liquid caught in the
85 body of the vat.

2. Apparatus according to claim 1, characterised by the fact that a pipe for the supply of cold liquid opens into the
90 bottom of the vat the latter being pro-
vided with an overflow pipe to allow liquid from the upper surface of the liquid in the vat to run off continuously during the continuous arrival of the cold
95 liquid at the bottom of the vat.

3. Apparatus according to claim 2, characterised by the fact that the over-
flow pipe is arranged relatively to the
bottom of the vat in such a way that a
100 shallow body of liquid is maintained in the vat.

4. Apparatus according to claim 3, characterised by the fact that the bottom
of the vat is nearly concentric with the
lower part of the churn when the latter
105 is in the working position.

5. Apparatus according to any preced-
ing claim, characterised by the fact that
it comprises means for heating the
110 liquid in the vat.

6. Apparatus according to claim 5, characterised by the fact that electrical
heating devices are immersed in the
liquid in the vat.

7. Apparatus according to claim 5, 115
characterised by the fact that the means
for heating the liquid in the vat is in the
form of a furnace having heat-insulated
external walls.

8. Apparatus according to claim 5, 120
characterised by the fact that the outside
walls of the vat are provided with a layer
of heat insulating material.

9. Apparatus according to one or other
of the preceding claims characterised by
125 the fact that the vat is provided with a cover.

10. Apparatus according to claim 9,
characterised by the fact that the cover
of the vat is guided in such a way that 130

it can only be raised from the closed position, by a vertical movement of translation up to a level at which it can then be tilted upwards on a pivot located near the edge of the cover opposite to that near which the person who raises the cover stands.

11. Apparatus according to claim 10, characterised by the fact that on the side opposite to that of said pivot, the cover extends substantially below the upper level of the vat and is mounted so that that part of it which is near the upper level of the vat is necessarily lifted before the whole of the cover is swung upwards about the pivot.

12. Apparatus according to any preceding claim, for the simultaneous treat-

ment of several churns, characterised by the fact that the vat is divided into several compartments provided with separate covers and in each of which a churn is placed.

13. For the thermal treatment on farms of milk and cream in the churns which serve for their transportation, apparatus substantially as herein described with reference to the accompanying drawings.

Dated this 16th day of May, 1946.

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Fig. 1.

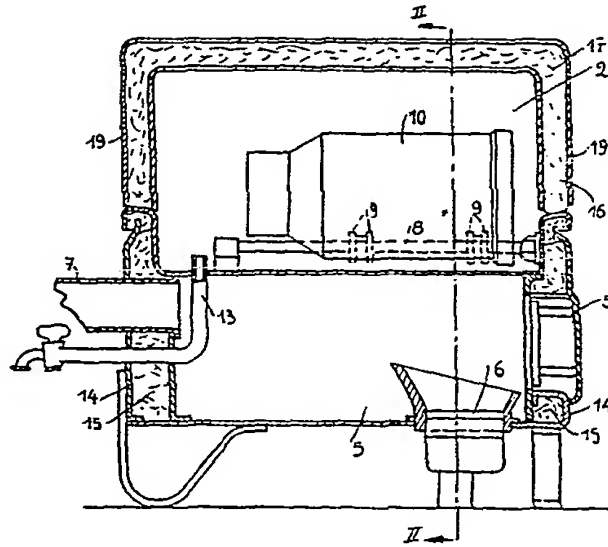
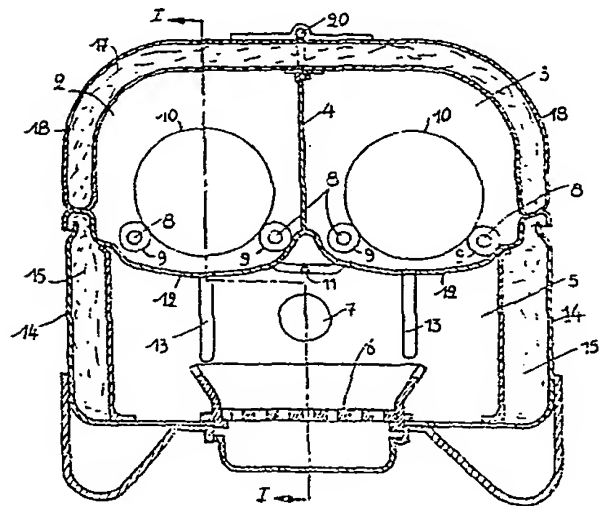


Fig. 2.



[This Drawing is a reproduction of the Original on a reduced scale.]

FIG. 3.

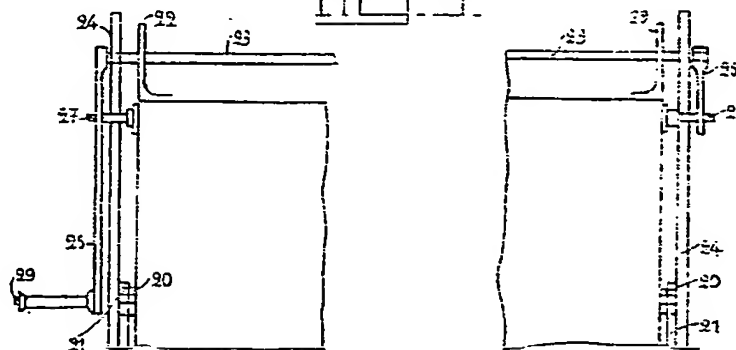
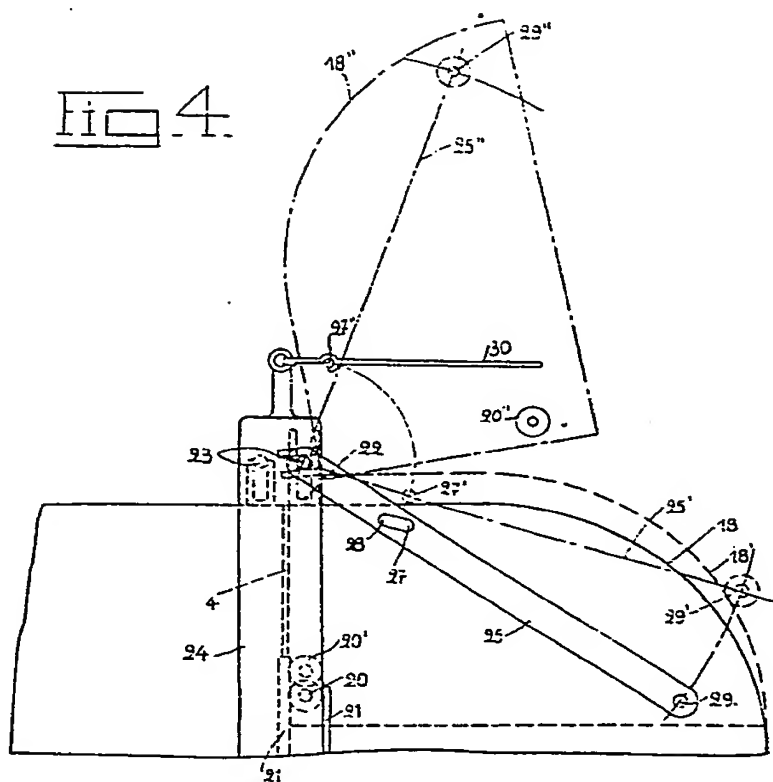


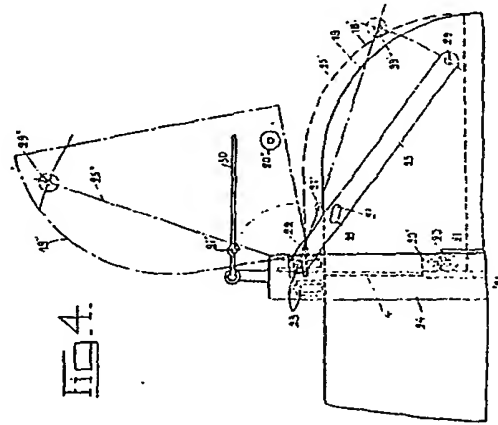
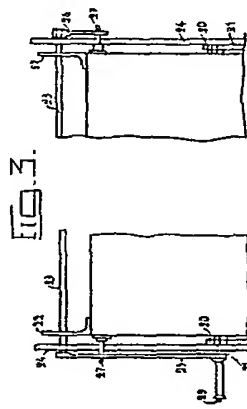
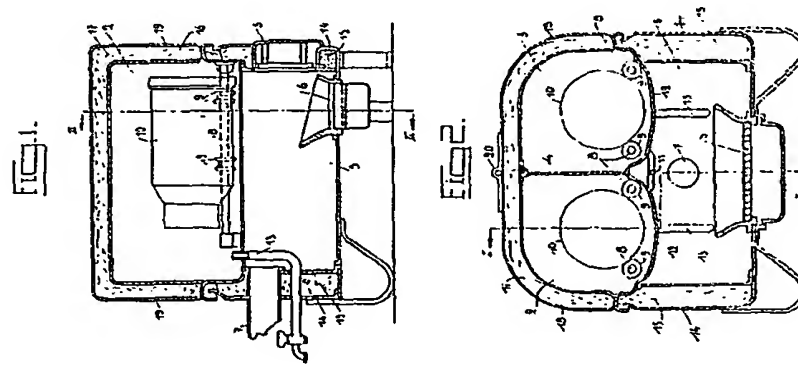
FIG. 4.



[This Drawing is a reproduction of the Original on a reduced scale]

634434 COMPLETE SPECIFICATION

SHEET 1



2 SHEETS
SHEET 2